Functionalization of corn stover with 3-aminopropyltrietoxysilane to uptake Reactive Red 141 from aqueous solutions

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Abstract

An alternative and low-cost adsorbent (CS–APTES) was developed by the functionalization corn stover (CS) with 3-aminopropyltrietoxysilane (APTES) using a simple method. Several analytical techniques were used to prove the functionalization and then, CS–APTES was employed to adsorb Reactive Red 141 (RR141) dye from aqueous solutions. The functionalization with APTES caused an increase of 15 times in the adsorption capacity. The adsorption of RR141 on CS–APTES was favored at pH 3.0 using a dosage of 3.0 g L^{-1}. The adsorption equilibrium was reached within 4 h, being the process thermodynamically favorable, endothermic, and controlled by chemisorption. The maximum adsorption capacity was 15.65 mg g^{-1}. CS–APTES was efficient to treat a colored effluent containing various ions and molecules. The use of 10 g L^{-1} of CS–APTES was sufficient to decolorize more than 98% of this effluent. It was concluded that CS–APTES can be easily prepared from CS, generating an efficient and low-cost adsorbent which, in turn, is able to treat colored effluents.

Keywords

3-aminopropyltrietoxysilane, Adsorption, Corn stover, Dyes, Functionalization, Low-cost adsorbent.